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# 2006 Minerals Yearbook

## MICA

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# Mica

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Mica production increased substantially in 2006 compared with that of 2005. In 2006, production of scrap and flake mica in the United States increased to 110,000 metric tons (t); this was 41% higher than that of 2005 (tables 1, 3). Ground mica sales totaled 123,000 t valued at $49 million, an increase in quantity and value compared with that of 2005 (tables 1, 4). Essentially all sheet mica used in the United States was imported, and India was the major supplier (table 10). Consumption of muscovite block mica was essentially unchanged at 1.11 t and the value increased to $146,000 in 2006 from 1.10 t valued at $134,000 in 2005 (tables 1, 5). Consumption of mica splittings decreased to 310 t in 2006 from a revised 402 t in 2005 (tables 1, 6). Worked and unworked sheet mica exports decreased to 1,400 t in 2006 from 1,430 t in 2005, and the value increased to $15.4 million in 2006 from $14.2 million in 2005 (table 13). U.S. imports of worked and unworked sheet mica increased to 1,770 t in 2006 from 1,390 t in 2005, and the value increased to $18.5 million in 2006 from $13.1 million in 2005.

The mica group represents 37 phyllosilicate minerals that have a layered or platy texture (Rieder and others, 1998). The commercially important micas are muscovite and phlogopite, which are used in a variety of applications. Mica's value is based on several of its unique physical properties. The crystalline structure of mica forms layers that can be split or delaminated into thin sheets. These sheets are chemically inert, dielectric, elastic, flexible, hydrophilic, insulating, lightweight, platy, reflective, refractive, resilient, and transparent to opaque. Mica is stable when exposed to electricity, light, moisture, and extreme temperatures. Based on its abundance and superior electrical properties, muscovite is the principal mica used by industry. Phlogopite mica remains stable at higher temperatures and is used in applications in which a combination of high-heat stability and electrical properties is required. Muscovite and phlogopite are used in sheet and ground forms.

## Legislation and Government Programs

The Annual Materials Plan for fiscal year 2006 authorized the disposal of the remaining inventory of mica (all types) from the National Defense Stockpile (NDS) classified as excess to goal. Stocks of mica classified as excess to goal at the end of fiscal year 2005 were all subject to no disposal limits. At the end of fiscal year 2006, NDS mica stocks authorized for disposal were 97 kg (214 pounds) of muscovite block (stained and better); 7,195 kg (15,863 pounds) of condenser quality muscovite block, which has all been sold (committed inventory); 203 kg (448 pounds) of electronic quality muscovite block, which has been sold (committed inventory); 6,815 kg (15,025 pounds) of muscovite splittings; and 2,723 kg (6,004 pounds) of muscovite splittings, which has been sold (committed inventory).

The Annual Materials Plan for fiscal year 2007 (AMP 2007) authorized the disposal of the remaining inventory of mica (all types) from the National Defense Stockpile (NDS) classified as excess to goal; 453,592 kg (1 million pounds) of mica was authorized for disposal and was footnoted as "actual quantity limited to remaining inventory." No mica was held for goal in the NDS at the beginning of fiscal year 2007. Remaining uncommitted stocks of mica in the NDS at the beginning of fiscal year 2007 were 222 kg (489 pounds) of muscovite block (stained and better) and 6, 815 kg (15,025 pounds) of muscovite splittings (table 2).

## Production

Domestic mine production data for mica are developed by the U.S. Geological Survey from four separate voluntary surveys. Of the 13 operations to which the "Crude Scrap and Flake Mica Production" (including sericite production) survey form was sent, 8 operations responded. Of the 15 operations to which the "Ground Mica" (excluding low-grade ground sericite production) form was sent, 5 operations responded. Of the five surveyed operations to which the "Mica Block and Film Consumption" form was sent, three operations responded. Of the nine surveyed operations to which the "Mica Splittings Consumption" form was sent, three operations responded. Consumption for the nonrespondents was estimated by using prior-year production data. Individual company production and consumption data are withheld to avoid disclosing company proprietary data.

***Scrap and Flake Mica.***—In 2006, 11 domestic companies with 13 mines in 5 States produced scrap and flake mica, excluding low-grade sericite. The United States was one of the world's primary producers with production of 110,000 t (tables 1, 3, 14). North Carolina remained the major producing State with 51% of domestic production, and the remainder was produced in Alabama, Georgia, South Carolina, and South Dakota. Mica was recovered from mica schist, high-quality sericite schist, weathered pegmatites, a gemstone pegmatite, and as a coproduct of feldspar and kaolin mining and processing operations. Mining was suspended at Velarde in 2004, which remained on care and maintenance throughout 2005.

The scrap and flake mica producers in 2006 were BASF Corp., Hartwell, GA; The Feldspar Corporation (a Zemex Industrial Minerals company) (two mines), Spruce Pine, NC; Georgia Industrial Minerals, Inc., Deepstep, GA; JMays LLC, Micaville, AL; K-T Feldspar Corp., Spruce Pine, NC; Kings Mountain Mining LLC (a Zemex Industrial Minerals company), Kings Mountain, NC; The Mineral Mining Co., Inc., Kershaw, SC; Pacer Corp., Custer, SD; and Unimin Corp., Spruce Pine, NC.

***Ground Mica.***—In 2006, 6 companies operated 10 grinding plants in 5 States; seven plants produced dry-ground mica, and three, wet-ground mica. The four leading ground mica companies, which included one company with four plants, accounted for 40% of the total of 123,000 t of ground mica produced in the United States (table 4).

Dry-ground mica producers were BASF Corp., Hartwell, GA; Georgia Industrial Minerals, Inc., Deepstep, GA; JMays LLC, Micaville, AL; K-T Feldspar, Spruce Pine, NC; Kings Mountain Mining LLC (a Zemex Industrial Minerals company), Kings Mountain, NC; The Mineral Mining Co., Inc., Kershaw, SC; Pacer, Custer, SD; Piedmont Minerals Corp., Hillsborough, NC; and United States Gypsum Co. (a subsidiary of USG Corp.), Spruce Pine, NC.

Wet-ground mica producers were BASF Corp., Hartwell, GA; Georgia Industrial Minerals, Inc., Sandersville, GA; JMays LLC, Micaville, AL; and Kings Mountain Mining LLC (a Zemex Industrial Minerals company), Kings Mountain, NC.

***Sheet Mica.***—Sheet mica was produced as a byproduct from two mines in 2006.

Small quantities of muscovite sheet and scrap mica were produced as a byproduct by Morefield Gem Mine, Inc. in Amelia County, VA. The pegmatite was mined primarily for gemstones and mineral specimens using underground methods. The mine also produced biotite and zinnwaldite mica.

The Micaville #1 Mine in Micaville was owned and operated by JMays. The mine produced small amounts of muscovite sheet mica as a byproduct of scrap and flake mica for dry- and wet-grinding.

## Consumption

***Ground Mica.***—The leading domestic use of dry-ground mica was in joint compound for filling and finishing seams and blemishes in gypsum wallboard (drywall) (table 4). The mica acts as a filler and extender, provides a smooth consistency, improves the workability of the compound, and provides resistance to cracking. In 2006, joint compound accounted for 49% of dry-ground mica consumption.

In the paint industry, ground mica is used as a pigment extender that also facilitates suspension, reduces chalking, prevents shrinking and shearing of the paint film, increases resistance of the paint film to water penetration and weathering, and brightens the tone of colored pigments. Mica also promotes paint adhesion in aqueous and oleoresinous formulations. Consumption of dry-ground mica in paint, the second ranked use, accounted for 11% of the dry-ground mica used in 2006.

Ground mica is used in the well-drilling industry as an additive to drilling muds. The coarsely ground mica flakes help prevent the loss of circulation by sealing porous sections of the drill hole. Well drilling muds accounted for less than 8% of dry-ground mica use.

The plastics industry used dry-ground mica as an extender and filler, especially in parts for automobiles for lightweight insulation to suppress sound and vibration. Mica is used in plastic automobile fascia and fenders as a reinforcing material, providing improved mechanical properties and increased dimensional stability, stiffness, and strength. Mica-reinforced plastics also have high-heat dimensional stability, reduced warpage, and the best surface properties of any filled plastic composite. In 2006, consumption of dry-ground mica in plastic applications accounted for 4.5% of the market.

The rubber industry used ground mica as an inert filler and mold release compound in the manufacture of molded rubber products, such as tires and roofing. The platy texture acts as an antiblocking, antisticking agent. Rubber mold lubricant accounted for 1.5% of the dry-ground mica used in 2006.

Dry-ground mica is used in the production of rolled roofing and asphalt shingles where it serves as a surface coating to prevent sticking of adjacent surfaces. The coating is not absorbed by freshly manufactured roofing because mica's platy structure is unaffected by the acid in asphalt or by weathering conditions. As a rubber additive, mica reduces gas permeation and improves resiliency.

Mica is used in decorative coatings on wallpaper, concrete, stucco, and tile surfaces. It also is used as an ingredient in flux coatings on welding rods, in some special greases, and as coatings for core and mold release compounds, facing agents, and mold washes in foundry applications.

Dry-ground phlogopite mica is used in automotive brake linings and clutch plates to reduce noise and vibrations (asbestos substitute); as sound-absorbing insulation for coatings and polymer systems; reinforcing additives for polymers to increase strength and stiffness and to improve stability to heat, chemicals, and ultraviolet (UV) radiation; heat shields and temperature insulation; industrial coating additive to decrease the permeability of moisture and hydrocarbons; and in polar polymer formulations to increase the strength of epoxies, nylons, and polyesters.

Wet-ground mica, which retains the brilliancy of its cleavage faces, is used primarily in pearlescent paints by the automotive industry. In the cosmetics industry, its reflective and refractive properties made mica an important ingredient in blushes, eyeliner, eyeshadow, foundation, hair and body glitter, lipstick, lip gloss, mascara, moisturizing lotions, and nail polish. Mica is added to latex balloons to provide a colored shiny surface.

Natural mica is used by the Taos and Picuris Pueblos Indians in north-central New Mexico to make pottery. The pottery is made from weathered pre-Cambrian mica schist and has flecks of mica throughout the vessels. Tewa Pueblo pottery is made by coating the clay with mica to provide a dense-glittery micaceous finish over the entire object.

***Built-Up Mica.***—Muscovite and phlogopite splittings were fabricated into various built-up mica products by nine companies that operated nine plants in seven States. Produced by mechanized or hand setting of overlapping splittings and alternate layers of binders and splittings, built-up mica is used primarily as an electrical insulation material. Mica insulation is used in high-temperature and fire-resistant power cable used in aluminum plants, blast furnaces, critical wiring circuits (for example, defense systems, fire and security alarm systems, and surveillance systems), heaters and boilers, lumber kilns, and metal smelters, and tanks and furnace wiring. Specific high-temperature mica-insulated wire and cable is rated to work for up to 15 minutes in molten aluminum, glass, and steel. Major

products are bonding materials; flexible, heater, molding, and segment plates; mica paper; and tape (table 7).

Flexible plate (cold) is used in electric motor and generator armatures, field coil insulation, and magnet and commutator core insulation. Mica consumption in flexible plate in 2006 was 21 t, a decrease from the 73 t in 2005.

Heater plate is used where high-temperature insulation is required. Consumption data for mica in heater plate are withheld to avoid disclosing company proprietary information. Consumption of heater plate mica decreased in 2006 compared with that of 2005.

Molding plate is sheet mica from which V-rings are cut and stamped for use in insulating the copper segments from the steel shaft ends at the end of a commutator. Molding plate is also fabricated into tubes and rings for insulation in armatures, motor starters, and transformers. Consumption of molding plate in 2006 was 65 t, a decrease from the 185 t from the previous year.

Segment plate acts as insulation between the copper commutator segments of direct-current universal motors and generators. Phlogopite built-up mica is preferred because it will wear at the same rate as the copper segments. Although muscovite has a greater resistance to wear, it causes uneven ridges that may interfere with the operation of a motor or generator. Consumption of segment plate was 149 t in 2006, a decrease from the 220 t in 2005.

Some types of built-up mica have the bonded splittings reinforced with cloth, glass, linen, muslin, plastic, silk, or special paper. These products are very flexible and are produced in wide, continuous sheets that are either shipped rolled or cut into ribbons, tapes, or trimmed to specified dimensions. Built-up mica products may also be corrugated or reinforced by multiple layering.

In 2006, the total amount of built-up mica that was consumed or shipped was 352 t, a decrease from the 558 t consumed or shipped in 2005. Molding plate and segment plate were the major end products and accounted for 19% and 42% of the total, respectively.

***Mica Paper (Reconstituted Mica).***—Primary uses for mica paper are the same as those for built-up mica. Three companies consumed scrap mica to produce mica paper for electrical applications. The principal source of the scrap was India. In 2006, the manufacturing companies were Asheville-Schoonmaker Mica Co., Newport News, VA; Corona Films Inc., West Townsend, MA; and Isovolta Inc./US Samica Corp., Rutland, VT.

***Sheet Mica.***—Sheet mica is used principally in the electronic and electrical industries. Its usefulness in these applications is derived from its unique electrical and thermal insulating properties and its mechanical properties, which allow it to be cut, punched, stamped, and machined to close tolerances.

The leading use of block mica is as an electrical insulator in electronic equipment. High-quality block mica is processed to line the gauge glasses of high-pressure steam boilers because of its flexibility, transparency, and resistance to heat and chemical attack. Other uses include diaphragms for oxygen-breathing equipment, marker dials for navigation compasses, optical filters, pyrometers, retardation plates in helium-neon lasers, thermal regulators, and stove and kerosene heater windows. Specialized applications for sheet mica are found in aerospace components in ground- and air-launched missile systems, laser devices, medical electronics, optical instrumentation, radar systems, radiation detector windows that are transparent to alpha emissions (Geiger-Mueller tubes), and for radiation treatment.

Only high-quality muscovite film mica, which is variously called India ruby mica or ruby muscovite mica, is used as a dielectric in capacitors. The highest quality film is used to manufacture capacitors for calibration standards. The next lower grade is used in transmitting capacitors. Receiving capacitors use a slightly lower grade of high-quality muscovite.

In 2006, consumption of ruby and nonruby muscovite block totaled 1.11 t, essentially unchanged from the 1.10 t consumed in 2005 (table 5). Stained and lower-than-stained quality remained in greatest demand and accounted for about 55% of consumption of ruby and nonruby mica block. Consumption of nonruby mica block was 51.7% for stained and lower-than-stained quality and 48.3% for good quality.

In 2006, five companies consumed muscovite block and film at five plants in four States—two in North Carolina and one each in New Jersey, Ohio, and Virginia.

In 2006, mica splittings represented the largest part of the sheet mica industry in the United States. Consumption of muscovite and phlogopite splittings was 310 t in 2006 compared with a revised 402 t in 2005 (table 6). Muscovite splittings from India accounted for essentially all domestic consumption. The remainder was primarily imported from Madagascar.

## Stocks

Reported yearend industry stocks of muscovite mica block (ruby and nonruby) decreased to 14.8 t in 2006 from 19.6 t in 2005. Industry stocks of muscovite and phlogopite mica splittings were essentially unchanged from the 2006 level of 111 t from the previous years level of 110 t (table 6).

## Prices

Sheet mica prices vary with grade and can range from less than $1 per kilogram for low-quality mica to more than $2,000 per kilogram for the highest quality. The average values of mica block and splittings consumed in the United States in 2006 compared with those of 2005 were as follows: muscovite block (ruby and nonruby) increased to $132 per kilogram from $122 per kilogram, muscovite and phlogopite splittings were slightly lower at $1.53 per kilogram, and muscovite and phlogopite block increased to $130 per kilogram in 2006 from a revised $125 per kilogram in 2005 (tables 1, 6). Phlogopite block decreased to $118 per kilogram from $142 per kilogram, and phlogopite splittings increased substantially to $31.73 per kilogram from $4.66 per kilogram.

In 2006, the average U.S. value of scrap and flake mica, which included high-quality sericite, decreased to $204 per metric ton from $248 per ton in 2005 (table 3). The average value for North Carolina flake mica decreased to $223 per ton from $265 per ton in 2005. The average value of dry-ground mica increased to $237 per ton, and the average value of wet-ground mica increased to $784 per ton (table 1).

## Foreign Trade

The value of U.S. exports of mica increased by 5.5% to $20.7 million, and the quantity decreased by 19.9% to 8,620 t (tables 1, 13). U.S. exports of mica excluding unworked mica scrap increased by 5.6% in value from those of 2005 to $20.5 million, while the quantity decreased by 19.4% to 8,090 t.

Domestic ground mica (powder) exports decreased to 4,990 t, a decrease of 2,160 t from that of 2005 (tables 8, 13). Ground mica exports decreased in value to $4.65 million in 2006 from $4.86 million in 2005. Exports of crude and rifted mica decreased to 641 t; this was down 18.6% from the 787 t exported in 2005, and their value decreased by 2.9% to $525 thousand in 2006 from $541 thousand in 2005 (table 9).

The value of U.S. imports of all mica increased by 27.2% to $33.4 million, and the quantity increased by 21.1% to 46,900 t. U.S. imports of mica excluding unworked mica scrap (less than $1.00 per kilogram) increased by 27.3% in value from those of 2005 to $29.9 million and by 26.7% in quantity to 30,000 t.

India continued to supply the United States with essentially all its supply of sheet and paper-quality scrap micas. Total imports for consumption of unworked split block, film, splittings, and mica sheet categorized as "Other" totaled about 17,200 t in 2006 (table 10). Imports of unworked low-value scrap mica (less than $1.00 per kilogram) increased to 16,900 t in 2006 compared with 15,000 t in 2005 (table 10). Demand strengthened for the low-value mica for use as a dry-ground additive for drywall compound, fillers, and paints.

In 2006, 27,400 t of powder mica was imported, mostly from Canada and China, about 6,000 t more than in 2005 (table 11). Worked mica imports were 1,420 t; this was 6.0% higher than those of 2005 (table 12).

## Outlook

The outlook for ground mica is for production growth of 1% to 3% per year for the next decade. The major markets for ground mica—drywall joint compounds and paints—are mature and relatively stable with growth tied to new housing starts and interest rates. To a lesser extent, widespread natural disasters, such as hurricanes and flooding, also affect the market by creating immediate demand for residential building materials. Demand is also affected by automobile production because interior and exterior parts typically contain dry-ground mica or engineered mica composites and exterior surfaces are painted with wet-ground pearlescent pigments and mica-containing coatings.

Domestic demand for crude and ground mica in 2007 and 2008 was expected to increase slowly. Demand for wet-ground mica used in pearlescent automotive coatings and dry-ground mica used in automotive fillers and plastics was also expected to increase slowly. Demand for ground mica in such smaller specialty markets as coated micas, cosmetics, nylon and polyester resins, and polypropylene composites was expected to increase at a rate slightly higher than the 1% to 3% production rate. Consumption of dry-ground mica was expected to increase by as much as 2% to 3% per year through 2007 unless higher interest rates and significantly higher home prices slow the increase in demand for new housing. Increasing fuel prices were expected to reduce demand for automobiles as disposable income decreased. Wet-ground mica was expected to show a slow 1% to 2% growth through 2020 as demand from the automotive industry increases in response to population growth and the use of pearlescent paints and engineered mica-bearing plastics and composites increases.

Demand for block mica was expected to increase slowly at about 1% per year during the next several years as demand increases in a few specialty markets, such as electronics. A shortage of high-quality block mica was expected to continue because of the generally low percentage of high-quality mica in currently mined deposits, mostly pegmatites.

Consumption of mica splittings, which is the principal type of sheet mica consumed in the United States, has been in the range of 300 to 1,000 metric tons per year (t/yr). With no potential new uses apparent and many substitute materials being used, no substantial growth is expected. Consumption of mica splittings was expected to remain in the range of 300 to 900 t/yr in the near future.

## Reference Cited

Rieder, Milan, Cavazzini, Giancarlo, D'yakonov, Y.S., Frank-Kamenetskii, V.A., Gottardi, Glauco, Guggenheim, Stephen, Koval, P.V., Mueller, Georg, Neiva, A.M.R., Radoslovich, E.W., Robert, Jean-Louis, Sassi, F.P., Takeda, Hiroshi, Weiss, Zdenek, and Wones, D.R., 1998, Nomenclature of the micas: Chantilly, VA, American Mineralogist IMA Mica Report, v. 83, no. 11-12, part 1, November-December, 1385 p.

## GENERAL SOURCES OF INFORMATION

### U.S. Geological Survey Publications

Mica (Natural), Scrap and Flake. Ch. in Mineral Commodity Summaries, annual.
Mica (Natural), Sheet. Ch. in Mineral Commodity Summaries, annual.
Mica. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

### Other

Economics of Mica, The (8th ed.). Roskill Information Services Ltd., 1997.
Mica. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

TABLE 1
SALIENT MICA STATISTICS[1]

| | | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| United States: | | | | | | |
| Production, sold or used by producers: | | | | | | |
| Scrap and flake mica: | | | | | | |
| Quantity | thousand metric tons | 81 | 79 | 99 | 78 | 110 |
| Value | thousands | $7,370 | $16,700 | $15,400 | $19,300 | $22,400 |
| Ground mica: | | | | | | |
| Quantity | thousand metric tons | 99 | 94 | 98 | 120 | 123 |
| Value | thousands | $29,600 | $28,600 | $27,200 | $47,200 | $49,000 |
| Prices: | | | | | | |
| Scrap and flake mica | dollars per metric ton | 90 | 213 | 155 | 248 r | 204 |
| Ground: | | | | | | |
| Wet | do. | 960 | 938 | NA | 776 r | 784 |
| Dry | do. | 180 | 205 | 269 | 226 r | 237 |
| Sheet, muscovite and phlogopite: | | | | | | |
| Block | dollars per kilogram | 67 | 67 | 67 | 125 r | 130 |
| Splittings | do. | 1.82 | 1.74 | 1.73 | 1.56 r | 1.53 |
| Consumption: | | | | | | |
| Block, muscovite: | | | | | | |
| Quantity | metric tons | 2 | 2 | 2 | 1 | 1 |
| Value | thousands | $134 | $120 | $114 | $134 | $146 |
| Splittings, all types | | | | | | |
| Quantity | metric tons | 573 | 669 | 668 | 402 r | 310 |
| Value | thousands | $1,040 | $1,160 | $1,150 | $626 r | $475 |
| Exports | metric tons | 10,500 | 11,200 | 10,900 | 10,800 | 8,620 |
| Imports | do. | 36,400 | 36,000 | 43,800 | 38,800 | 46,900 |
| World, production | do. | 278,000 r | 279,000 r | 322,000 r, e | 288,000 r, e | 342,000 e |

eEstimated. rRevised.

[1]Data are rounded to no more than three significant digits.

TABLE 2
STOCKPILE STATUS AND GOVERNMENT INVENTORIES FOR MICA, DECEMBER 31, 2006

(Metric tons)

| | Inventory, uncommitted | | | |
|---|---|---|---|---|
| Material | Stockpile grade | Nonstockpile grade | Available for disposal | Fiscal year 2006 sales |
| Block: | | | | |
| Muscovite: | | | | |
| Stained and better | (1) | -- | (2) | -- |
| Stained and lower | -- | -- | (2) | -- |
| Phlogopite | -- | -- | (2) | -- |
| Film, muscovite (first and second qualities) | -- | -- | (2) | -- |
| Splittings: | | | | |
| Muscovite | 7 | -- | (2) | -- |
| Phlogopite | -- | -- | (2) | -- |

-- Zero.

[1]Less than ½ unit.

[2]The total disposal plan for all categories of mica in the national stockpile is undifferentiated at 453.592 metric tons (1 million pounds).

Source: Defense National Stockpile Center.

TABLE 3
SCRAP AND FLAKE MICA SOLD OR USED BY
PRODUCERS IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars)

| | 2005 | | 2006 | |
|---|---|---|---|---|
| State | Quantity | Value | Quantity | Value |
| North Carolina | 39 | 10,200 | 57 | 12,600 |
| Other[3] | 40 | 9,070 | 53 | 9,800 |
| Total | 78 | 19,300 | 110 | 22,400 |

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes finely divided mica recovered from mica schist and high-quality sericite schist, and mica that is a byproduct of feldspar and kaolin beneficiation.

[3]Includes Alabama, Georgia, South Carolina, and South Dakota.

TABLE 4
GROUND MICA SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY END USE AND METHOD OF GRINDING[1, 2]

| | 2005 | | | 2006 | | |
|---|---|---|---|---|---|---|
| | Quantity (thousand metric tons) | Value (thousands) | Unit value | Quantity (thousand metric tons) | Value (thousands) | Unit value |
| End use: | | | | | | |
| Joint cement | 63 | $15,000 | $238 | 60 | $15,200 | $254 |
| Paint | 14 | 4,550 | 328 | 13 | 3,740 | 288 |
| Plastics | 4 | 2,070 | 518 | 6 | 3,520 | 586 |
| Well-drilling mud | (3) | (3) | 148 | (3) | (3) | 162 |
| Other[4] | 39 | 25,600 | 654 | 44 | 26,500 | 602 |
| Total | 120 | 47,200 | 393 | 123 | 49,000 | 398 |
| Method of grinding: | | | | | | |
| Dry | W | W | 226 r | W | W | 237 |
| Wet | W | W | 776 r | W | W | 784 |

rRevised. W Withheld to avoid disclosing company proprietary data.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Domestic and some imported scrap. Low-quality sericite is not included.

[3]Withheld to avoid disclosing company proprietary data; included in "Other."

[4]Includes mica used for molded electrical insulation, roofing, rubber, textile and decorative coatings, welding rods, and miscellaneous.

TABLE 5
FABRICATION OF MUSCOVITE BLOCK MICA
IN THE UNITED STATES, BY QUALITY[1]

(Metric tons)

| | 2005 | 2006 |
|---|---|---|
| Good stained or better | 0.44 | 0.49 |
| Stained or lower than stained[2] | 0.65 | 0.61 |
| Total | 1.10 | 1.11 |

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes punch mica.

TABLE 6
CONSUMPTION AND STOCKS OF MICA SPLITTINGS
IN THE UNITED STATES[1]

| | Consumption | | Stocks on |
|---|---|---|---|
| | Quantity | Value | December 31 |
| Year | (metric tons) | (thousands) | (metric tons) |
| 2005[r] | 402 | $626 | 110 |
| 2006 | 310 | 475 | 111 |

[r]Revised.
[1]Data are rounded to no more than three significant digits.

TABLE 7
BUILT-UP MICA SOLD OR USED IN THE UNITED STATES, BY PRODUCT[1, 2]

| | 2005 | | 2006 | |
|---|---|---|---|---|
| | Quantity | Value | Quantity | Value |
| | (metric tons) | (thousands) | (metric tons) | (thousands) |
| Flexible plate (cold) | 74 [r] | $291 [r] | 21 | $157 |
| Heater plate | W | W | W | W |
| Molding plate | 89 [r] | 470 [r] | 65 | 432 |
| Segment plate | 149 [r] | 289 [r] | 149 | 294 |
| Tape | W | W | W | W |
| Other | 126 [r] | 520 [r] | 116 | 539 |
| Total | 437 [r] | 1,570 [r] | 352 | 1,420 |

[r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Other."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Consists of alternating layers of binder and irregularly arranged and partly overlapped splittings.

TABLE 8

U.S. EXPORTS OF CRUDE AND RIFTED MICA, MICA POWDER, AND WASTE IN 2006, BY COUNTRY[1]

| | Crude and rifted | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Less than $1 per kilogram | | More than $1 per kilogram | | Powder | | Waste | |
| Country | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) |
| Argentina | 63 | $22 | -- | -- | 10 | $3 | -- | -- |
| Australia | -- | -- | -- | -- | 9 | 7 | -- | -- |
| Bahamas, The | -- | -- | 89 | $224 | -- | -- | -- | -- |
| Barbados | -- | -- | -- | -- | 2 | 7 | -- | -- |
| Belgium | -- | -- | -- | -- | 422 | 441 | -- | -- |
| Bolivia | -- | -- | -- | -- | 32 | 19 | -- | -- |
| Brazil | -- | -- | -- | -- | 17 | 31 | -- | -- |
| Canada | 60 | 14 | -- | -- | 1,780 | 1,160 | 1,600 | $370 |
| China | -- | -- | -- | -- | 115 | 122 | -- | -- |
| Colombia | 191 | 98 | -- | -- | 72 | 62 | -- | -- |
| Congo | -- | -- | -- | -- | 21 | 8 | -- | -- |
| Costa Rica | -- | -- | -- | -- | 19 | 8 | -- | -- |
| Dominica | -- | -- | -- | -- | 12 | 10 | -- | -- |
| Dominican Republic | 5 | 4 | -- | -- | 21 | 5 | -- | -- |
| El Salvador | 9 | 4 | -- | -- | 26 | 5 | -- | -- |
| France | -- | -- | -- | -- | 90 | 161 | 103 | 22 |
| Germany | -- | -- | -- | -- | 361 | 249 | -- | -- |
| Hong Kong | -- | -- | -- | -- | 94 | 228 | -- | -- |
| Indonesia | -- | -- | -- | -- | (2) | 3 | -- | -- |
| Italy | -- | -- | -- | -- | 82 | 18 | -- | -- |
| Jamaica | -- | -- | 21 | 22 | -- | -- | -- | -- |
| Japan | 102 | 88 | -- | -- | 359 | 261 | (2) | 9 |
| Kenya | -- | -- | -- | -- | 5 | 13 | -- | -- |
| Korea, Republic of | -- | -- | -- | -- | 421 | 359 | -- | -- |
| Malaysia | -- | -- | (2) | 9 | -- | -- | -- | -- |
| Mexico | 98 | 21 | -- | -- | 478 | 307 | 6 | 3 |
| Netherlands | -- | -- | -- | -- | 134 | 620 | (2) | 3 |
| Panama | -- | -- | (2) | 4 | -- | -- | -- | -- |
| Peru | -- | -- | -- | -- | 2 | 21 | -- | -- |
| Philippines | -- | -- | -- | -- | 45 | 47 | -- | -- |
| Poland | -- | -- | -- | -- | 17 | 10 | -- | -- |
| Russia | -- | -- | -- | -- | -- | -- | 3 | 44 |
| Saudi Arabia | -- | -- | -- | -- | 103 | 51 | -- | -- |
| Singapore | -- | -- | -- | -- | 10 | 6 | -- | -- |
| Spain | -- | -- | -- | -- | 19 | 25 | -- | -- |
| South Africa | -- | -- | -- | -- | 38 | 11 | -- | -- |
| Switzerland | -- | -- | -- | -- | (2) | 3 | -- | -- |
| Taiwan | -- | -- | -- | -- | 30 | 41 | -- | -- |
| Thailand | -- | -- | -- | -- | 2 | 22 | -- | -- |
| Trinidad and Tobago | -- | -- | 1 | 9 | 8 | 3 | -- | -- |
| United Arab Emirites | -- | -- | 1 | 6 | -- | -- | -- | -- |
| United Kingdom | -- | -- | -- | -- | 112 | 240 | -- | -- |
| Venezuela | -- | -- | -- | -- | 54 | 64 | -- | -- |
| Total | 528 | 252 | 113 | 273 | 4,990 | 4,650 | 1,710 | 452 |

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF WORKED MICA IN 2006, BY COUNTRY[1]

| Country | Plates, sheets | | Other | |
|---|---|---|---|---|
| | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) |
| Antigua and Barbuda | 1 | $12 | -- | -- |
| Argentina | (2) | 3 | (2) | $6 |
| Aruba | 2 | 6 | -- | -- |
| Australia | 7 | 138 | 1 | 16 |
| Austria | -- | -- | 209 | 2,140 |
| Bahamas, The | -- | -- | 1 | 3 |
| Belgium | 2 | 43 | 1 | 21 |
| Brazil | 34 | 745 | -- | -- |
| Canada | 115 | 3,010 | 126 | 1,940 |
| Chile | 25 | 76 | -- | -- |
| China | 34 | 256 | 23 | 691 |
| Colombia | 61 | 284 | 6 | 60 |
| Costa Rica | 10 | 51 | (2) | 3 |
| Czech Republic | (2) | 11 | -- | -- |
| Dominican Republic | 1 | 52 | -- | -- |
| Egypt | 1 | 21 | -- | -- |
| El Salvador | 4 | 99 | 1 | 5 |
| France | 3 | 48 | (2) | 15 |
| Germany | 9 | 185 | 1 | 18 |
| Greece | 6 | 69 | -- | -- |
| Guatemala | 10 | 80 | -- | -- |
| Guyana | 2 | 7 | -- | -- |
| Honduras | 11 | 31 | (2) | 12 |
| Hong Kong | 3 | 34 | 2 | 21 |
| India | 3 | 87 | (2) | 22 |
| Indonesia | 2 | 82 | -- | -- |
| Ireland | 49 | 159 | -- | -- |
| Israel | 41 | 259 | -- | -- |
| Italy | 21 | 188 | -- | -- |
| Jamaica | -- | -- | 4 | 8 |
| Japan | 2 | 49 | 33 | 252 |
| Korea, Republic of | 60 | 675 | (2) | 5 |
| Mexico | 9 | 223 | 15 | 598 |
| Netherlands | 3 | 58 | (2) | 23 |
| Pakistan | -- | -- | 1 | 3 |
| Panama | -- | -- | 1 | 17 |
| Poland | -- | -- | 1 | 26 |
| South Africa | 9 | 140 | (2) | 7 |
| Spain | 2 | 26 | -- | -- |
| Sri Lanka | 3 | 9 | -- | -- |
| Sweden | 1 | 5 | -- | -- |
| Switzerland | 7 | 115 | 1 | 18 |
| Taiwan | 41 | 345 | 11 | 235 |
| Thailand | 6 | 32 | (2) | 7 |
| Trinidad and Tobago | 1 | 10 | -- | -- |
| United Kingdom | 3 | 48 | 1 | 25 |
| Venezuela | 241 | 1,030 | (2) | 5 |
| Vietnam | -- | -- | 1 | 55 |
| Other | 2 | 43 | (2) | 10 |
| Total | 845 | 8,840 | 438 | 6,270 |

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF CRUDE AND RIFTED MICA IN 2006, BY COUNTRY[1]

| | Split block | | Splittings | | Other | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Less than $1 per kilogram | | More than $1 per kilogram | |
| Country | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) |
| Canada | -- | -- | -- | -- | 20 | $3 | -- | -- |
| China | -- | -- | -- | -- | 5,610 | 726 | -- | -- |
| Finland | -- | -- | -- | -- | 791 | 408 | -- | -- |
| Germany | -- | -- | -- | -- | -- | -- | (2) | $3 |
| Hong Kong | -- | -- | -- | -- | -- | -- | 1 | 9 |
| India | (2) | $23 | 308 | $162 | 10,300 | 2,330 | -- | -- |
| Indonesia | -- | -- | -- | -- | 144 | 32 | -- | -- |
| Japan | -- | -- | -- | -- | -- | -- | 46 | 49 |
| Madagascar | -- | -- | -- | -- | -- | -- | (2) | 10 |
| Total | (2) | 23 | 308 | 162 | 16,900 | 3,500 | 47 | 71 |

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF MICA POWDER AND WASTE IN 2006, BY COUNTRY[1]

| | Powder | | Waste | |
|---|---|---|---|---|
| Country | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) |
| Argentina | 311 | $248 | -- | -- |
| Austria | 63 | 25 | -- | -- |
| Canada | 13,600 | 5,100 | 56 | $55 |
| China | 10,500 | 1,470 | -- | -- |
| Finland | 2,040 | 517 | -- | -- |
| France | 4 | 44 | -- | -- |
| Germany | 71 | 111 | -- | -- |
| India | 164 | 193 | 862 | 380 |
| Italy | (2) | 9 | -- | -- |
| Japan | 631 | 3,300 | -- | -- |
| Korea, Republic of | 24 | 16 | -- | -- |
| United Kingdom | 3 | 8 | -- | -- |
| Total | 27,400 | 11,000 | 918 | 434 |

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12

U.S. IMPORTS FOR CONSUMPTION OF WORKED MICA IN 2006, BY COUNTRY[1]

| Country | Plates, sheets | | Other | |
|---|---|---|---|---|
| | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) |
| Australia | 6 | $131 | -- | -- |
| Austria | 108 | 2,350 | 21 | $652 |
| Belgium | 329 | 4,160 | -- | -- |
| Brazil | 273 | 944 | (2) | 8 |
| Canada | 1 | 38 | (2) | 4 |
| China | 297 | 711 | 44 | 323 |
| Czech Republic | (2) | 9 | -- | -- |
| France | 8 | 62 | 2 | 85 |
| Germany | 27 | 571 | (2) | 4 |
| Hong Kong | -- | -- | 6 | 39 |
| India | 32 | 473 | 168 | 1,060 |
| Indonesia | -- | -- | (2) | 3 |
| Italy | 1 | 18 | 1 | 5,030 |
| Japan | 14 | 321 | 2 | 38 |
| Korea, Republic of | 1 | 14 | 22 | 30 |
| Netherlands | 6 | 103 | -- | -- |
| Romania | 1 | 11 | -- | -- |
| Singapore | 1 | 15 | -- | -- |
| Switzerland | 22 | 409 | -- | -- |
| Taiwan | 1 | 5 | 1 | 13 |
| United Kingdom | 1 | 28 | 18 | 540 |
| Vietnam | -- | -- | 3 | 6 |
| Total | 1,130 | 10,400 | 288 | 7,830 |

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 13
SUMMATION OF U.S. MICA TRADE DATA[1]

| | Scrap and flake mica | | | | Sheet mica | | | |
|---|---|---|---|---|---|---|---|---|
| | Powder | | Waste | | Unworked | | Worked | |
| | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) |
| Exports: | | | | | | | | |
| 2005 | 7,140 | 4,860 | 2,190 | 615 | 74 | 269 | 1,350 | 13,900 |
| 2006 | 4,990 | 4,650 | 2,240 | 704 | 113 | 273 | 1,280 | 15,100 |
| Imports for consumption: | | | | | | | | |
| 2005 | 21,400 | 10,100 | 15,900 r | 3,260 r | 44 r, 2 | 81 r, 2 | 1,340 | 12,900 |
| 2006 | 27,400 | 11,000 | 17,800 | 3,930 | 355 2 | 256 2 | 1,420 | 18,500 |

rRevised.

[1]Data are rounded to no more than three significant digits.

[2]Excludes unworked sheet mica valued at less than $1 per kilogram.

Source: U.S. Census Bureau.

TABLE 14
MICA: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

| Country[3] | 2002 | 2003 | 2004e | 2005e | 2006e |
|---|---|---|---|---|---|
| Argentina, all grades | 1,770 | 1,894 | 2,158 r, 4 | 4,104 r | 4,000 |
| Brazil[e] | 4,000 | 4,000 r | 4,000 r | 4,000 r | 4,000 |
| Canada[e] | 17,500 | 17,500 | 17,500 | 17,500 | 17,500 |
| France[e] | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| India: | | | | | |
| Crude[e] | 1,500 | 1,600 | 1,600 | 1,600 | 1,700 |
| Scrap and waste | 2,000 | 2,000 e | 2,100 r | 2,100 | 2,200 |
| Total | 3,500 | 3,600 e | 3,700 r | 3,700 | 3,900 |
| Iran[5] | 2,845 | 5,500 r | 7,032 4 | 7,000 | 7,000 |
| Korea, Republic of, all grades | 29,870 | 33,645 | 59,238 4 | 36,623 r, 4 | 37,000 |
| Madagascar, phlogopite | 102 r | 70 e | 70 | 70 | 70 |
| Malaysia | 3,669 | 3,609 | 3,544 4 | 4,542 r, 4 | 4,000 |
| Mexico, all grades | 456 | 506 | 424 | 120 r | 125 |
| Norway, flake[e] | 2,600 | 2,600 | 2,600 | 2,700 | 26,000 |
| Russia[e] | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| Serbia and Montenegro[e, 6] | 100 | 100 | 100 | 100 | 100 |
| South Africa, ground and scrap | 821 | 1,003 | 285 r, 4 | 924 r, 4 | 880 |
| Spain | 11,786 r | 11,800 r | 7,825 r | 8,000 r | 8,000 |
| Sri Lanka, scrap | 1,161 | 1,674 | 1,700 | 1,700 | 1,800 |
| Taiwan | 6,595 | 3,237 | 2,979 4 | 8,608 4 | 8,000 4 |
| United States, scrap and flake[7] | 81,100 | 78,600 | 99,200 4 | 78,100 4 | 110,000 4 |
| Grand total | 278,000 r | 279,000 r | 322,000 r | 288,000 r | 342,000 |

eEstimated. rRevised. -- Zero.

[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through May 30, 2007.

[3]In addition to the countries listed, China, Pakistan, Romania, and Sweden are known to produce mica, but available information is inadequate to make reliable estimates of output levels.

[4]Reported figure.

[5]Year beginning March 21 of that stated.

[6]In June 2006, Montenegro and Serbia formally declared independence from each other and dissolved their union. Mineral production data for 2006, however, still reflect the unified country.

[7]Excludes, if any, U.S. production of low-quality sercite and sheet mica.